REMARKS

Applicant appreciates the considered withdrawal of the previous anticipation rejections, and looks forward to this response receiving the examiner's careful attention. The complex subject matter involved in the instant application, and in the cited references, has resulted in lengthy office actions and correspondingly long responses from the Applicant. That development is unfortunate from the Applicant's perspective, given the clear distinctions between the instant claims and all references cited to date. The below discussion is aimed at succinctly narrowing the issues involved in the current obviousness rejections.

First, independent claims 1, 17, 31, and 45 are each amended in this response to clarify the nature of the claimed cancellation metric. Particularly, all independent claims now claim, "a cancellation metric comprising a scalar value ~~corresponding to~~ representing characterized or measured inter-symbol interference cancellation performance of the receiver." (Respectively depending claims 10, 15, 25, and 39 are amended to be consistent with the independent claim amendments.) Paragraph [0028] in the instant application explicitly states that the cancellation metric reflects the characterized or measured ISI cancellation performance of a given ISI-canceling receiver. Paragraph [0031] in the instant application states that cancellation metric is a scalar value that reflects the expected ISI cancellation performance of the receiver, such that an estimate of ISI can be scaled by the cancellation metric, so that the resultant scaled ISI represents the reduction in ISI that will be obtained by the receiver's ISI cancellation processing.

"Bottomley I" and "Bottomley II" demonstrably lack any teachings related to the explicitly claimed cancellation metric, and to the explicitly claimed use of the cancellation metric to obtain a received signal quality estimate that accurately accounts for the expected ISI-cancellation in an ISI-canceling receiver. Put simply, the receivers in "Bottomley I" and "Bottomley II," provide ISI suppression and thereby improve received signal quality but they objectively do not teach, suggest, or even hint at how an ISI-canceling receiver can compute a received signal quality

that reflects the ISI-canceling performance of the receiver independently from actually carrying out ISI suppression operations on the received signal. Absent any such teachings, the rejection of claims 1-47 as obvious over Bottomley I and II fails as a matter of law.

More particularly, the obviousness rejection of claims 1-47 fails as a matter of law because it depends on erroneous factual findings that are plainly contradicted by the written record. The Patent Office's factual findings regarding Bottomley I and II are contradicted by the actual teachings of those references. These fact-finding errors introduce significant critical errors in the Patent Office's determination of the differences between the references and Applicant's claims. That determination is a key element in the basic factual inquiries for determining obviousness, as set forth in Graham v. John Deere Co. of Kansas City, 383 U.S. 1, 148 USPQ 459 (1966).

Under the Graham framework, the Patent Office must, among other tasks, (1) determine the scope and contents of the prior art, and (2) ascertain the differences between the claims at issue and the prior art. The Patent Office's recently issued document, "Examination Guidelines for Determining Obviousness Under 35 U.S.C. 103 in View of the Supreme Court Decision in KSR International Co. v. Teleflex Inc.," emphasizes that "Office personnel fulfill the critical role of factfinder when resolving the Graham inquiries," and that "[w]hen making an obviousness rejection, Office personnel must therefore ensure that the written record includes findings of fact concerning the state of the art and the teachings of the references applied."

The examiner's findings of fact in this Office Action are erroneous and unsupported by the written record. For example, amended independent claim 1 is representative of the claimed subject matter at issue and includes in its entirety:

> 1. A method of determining received signal quality for a received signal in an inter-symbol interference canceling receiver comprising:
> generating an estimate of inter-symbol interference in the received signal;
> scaling the estimated inter-symbol interference by a cancellation metric comprising a scalar value representing characterized or measured inter-symbol interference cancellation performance of the receiver; and

estimating the received signal quality based on the scaled estimate of inter-symbol interference.

(Emphasis added.)

The rejection arguments on p. 6 of the Office Action state that Section IV, Equations 43 and 44 of Bottomley I teach the limitation of "estimating the received signal quality based on the scaled estimate of inter-symbol interference." That argument is contradicted by Equation 43 in Bottomley I, which calculates received signal quality as a function of an impairment covariance matrix $\mathbf{R}_u$ and corresponding "Generalized Rake" combining weights w. Notably absent from Equation 43 is any estimate of ISI in the received signal that has been scaled by a scalar value representing characterized or measured ISI cancellation performance of the receiver in question. Indeed, Equation 43 of Bottomley I is an example of being able to calculate received signal quality only after the potentially burdensome computation of the covariance matrix $\mathbf{R}_u$, the combining weights w, which the instant invention expressly states that it advantageously avoids.

See, for example, the Summary in the instant application at paragraph [0007], where Applicant teaches that, "[b]y accounting for ISI cancellation performance of the receiver based on a simple scaling metric, accurate received signal quality measurements are obtained in a manner that accounts for un-cancelled ISI in the received signal without requiring use of potentially complex multipath combining weight calculations in the signal quality calculations." (Emphasis added.) Paragraph [0067] and other sections in the instant application teach that the claimed signal quality calculations allow an ISI-canceling receiver to compute accurate signal quality estimates early within a timeslot, without having to wait for carrying out the potentially complex calculations associated with impairment covariance matrix estimation and combining weight calculations.

Equation 44 of Bottomley I also demonstrably does not teach the claimed received signal quality estimation. Equation 44 takes advantage of the expression for $\mathbf{R}_u$ as given in Equations 21 and 22 in Bottomley I, which express $\mathbf{R}_u$ as a sum of a covariance matrix $\mathbf{R}_{ISI}$ representing cross-finger impairment correlations arising from ISI and a covariance matrix $\mathbf{R}_{MUI}$ representing cross-finger impairment correlations arising from multi-user interference. As plainly seen from Equation 44, there is no estimate of ISI scaled by a cancellation metric (or any other metric). Indeed, even if the Patent Office argues that the covariance matrix $\mathbf{R}_{ISI}$ is the claimed estimate of ISI, one sees in Equation 43 that $\mathbf{R}_{ISI}$ is multiplied by an estimate of the received signal, and is not in any sense "scaled" by a cancellation metric. Moreover, one sees from Equation 43 the need to compute potentially large matrix inverses that are based on $\mathbf{R}_{ISI}$ and/or $\mathbf{R}_u$. Again, the instant application carefully explains that its teachings provide a way to accurately estimate received signal quality in view of the ISI cancellation performance of a given receiver, without having to carry out the ISI cancellation processing. These teachings are directly reflected in the plain, unambiguous claim limitations at issue.

As a further factual error, the Patent Office asserts that Section III, Fig. 2, and Equations 7-9 of Bottomley I teach the limitation in claim 1 of scaling an estimate of ISI by a scalar-valued cancellation metric that corresponds to the receiver's ISI cancellation performance. (Applicant notes that the amended claim 1 emphasizes that the claimed cancellation metric is a scalar value that represents the characterized or measured ISI cancellation performance of the receiver.)

Equation 7 in Bottomley 1 does no more than state that a Rake receiver produces received signal symbol detection statistics by combining the despread values from individual Rake fingers using combining weights w. It is immediately apparent to one skilled in the art and

easily proven that Equation 7 in no way represents the claimed scaling of estimated ISI. Equation 8 does no more than state that the vector of (Rake) finger outputs can be expressed as the sum of "u" which "models overall noise (noise + interference)," and the received symbol multiplied by the channel vector h. Again, it is immediately apparent to one skilled in the art and easily proven that Equation 8 in no way represents the claimed scaling of estimated ISI. Finally, Equation 9 presents a formula for calculating the combining weights w, which are used to weight the actual despread signal values being output by the Rake fingers under consideration. Combining the Rake finger outputs with this weighting suppresses ISI in the Rake-combined signal because the weights are computed a function of the impairment covariance matrix $\mathbf{R}_u$. Again, it is immediately apparent to one skilled in the art and easily proven that Equation 8 in no way represents the claimed scaling of estimated ISI.

The Patent Office introduces further serious errors in the factual record by stating on p. 6 that Bottomley I "fails to teach a scalar value corresponding to inter-symbol interference," and then further stating that, "...Bottomley II does." The claimed cancellation metric is a scalar value that represents the inter-symbol interference *cancellation performance* of a receiver. The claims and specification-as-filed explicitly teach that the cancellation metric is a scalar value that represents the characterized or measured ISI *cancellation performance* of the receiver—i.e., a scalar value representing the extent to which the receiver cancels ISI—and decidedly is not taught as a scalar value representing the actual ISI in a received signal. For arguments sake, assume the claimed cancellation metric is 0.1—see paragraph [0032] of the instant application. With this value, the claimed estimate of ISI would be scaled by 0.1, such that the resulting scaled estimate of ISI represents the amount of ISI expected to be remaining in the received signal after ISI cancellation processing by the receiver. The value of 0.1 has nothing to do with the estimated amount of ISI actually in the received signal.

Thus, the Patent Office misunderstands the claim limitations at issue and misunderstands or mischaracterizes Bottomley I and II by pinning the analysis on whether Bottomley I or II represent actual ISI in a received signal using a scalar value. This clear factual error alone undermines the Patent Office's factual basis for making the obviousness rejections.

This error is compounded by making factually erroneous, technically unsupported assertions that "ISI factors" are equivalent to the claimed cancellation metric, and that these ISI factors obviously combine with Bottomley I to produce the invention claimed in independent claim 1 (and in the other independent claims 17, 31, and 45). The ISI factors of Bottomley II demonstrably are not the claimed scalar-valued cancellation metric, and demonstrably do not combine with Bottomley I in any manner asserted by the Patent Office.

In more detail, Bottomley II teaches the use of ISI factors to generate revised symbol estimates produced by a Rake processor. See, e.g., lines 53-57 of col. 6. The revised symbol estimates yield improved bit error rate performance as compared to the unrevised symbol estimates output by the Rake processor—see Fig. 12 of Bottomley II. Plainly and unambiguously, Bottomley II does not teach scaling an estimate of ISI in a received signal by its disclosed ISI factors; Rather, Bottomley II expressly teaches revising actual symbol estimates produced by a Rake processor based on its computed ISI factors.

The details of Bottomley II objectively demonstrate that its ISI factors cannot be legally construed as the claimed cancellation metric. Indeed Bottomley II teaches in Fig. 6, Block 630, and at col. 6, lines 30-38, that its ISI factors (referred to as s-parameters) are computed by calculating the convolution of the convolution of channel impulse response and chip pulse shape autocorrelation functions and the aperiodic cross-correlation function of spreading sequences. Further, Bottomley II explains at col. 6, line 65 – col. 7, line 10, that a Rake combiner 434 produces first estimates 435 of received signal symbols, and that a (Maximum

Likelihood) sequence estimator 470 processes the first estimates 435 according to a sequence estimation procedure that uses a branch metric calculated as a function of the ISI factors 465.

Computing branch metrics in a sequence estimation process based on ISI factors calculated as a convolution of channel impulse response autocorrelation and chip pulse shape autocorrelation and aperiodic cross-correlations of the involved spreading codes—see Bottomley II at col. 8, lines 30-38—cannot legally be construed as relating in any sense to use of the claimed scalar-valued cancellation metric. Moreover, suggesting that the ISI factors from Bottomley II would have been obvious to incorporate into Bottomley I represents a profound misunderstanding of Bottomley I and II.

To wit, Bottomley I presented a new Rake receiver architecture, referred to as a "Generalized Rake Receiver," wherein the combining weights used for combining Rake finger outputs are computed as a function of an impairment covariance matrix that represents the correlation of signal impairment across the Rake fingers. Thus, the act of combining the Rake outputs according to these combining weights suppresses ISI in the resulting Rake-combined signal. In contrast, Bottomley II teaches a conventional Rake processor—not a Generalized Rake processor—that produces Rake-combined symbol estimates. Those estimates are then processed in a maximum likelihood sequence estimator, whose branch metrics are computed by ISI factors formed from autocorrelation/cross-correlation functions.

Put more simply, the Rake-combined values produced in Bottomley I already have interference suppression canceled from them, by virtue of being combined with the combining weights disclosed in Bottomley I. In contrast, Bottomley II produces "conventional" Rake-combined values from which ISI has not been canceled, and then uses those combined values in a maximum likelihood sequence estimation process to suppress ISI. The ISI factors disclosed in Bottomley II are not computed in the same or even approximately the same manner as the covariance matrices in Bottomley I, nor could they be used to produce ISI-suppressing

combining weights in any manner taught by Bottomley I. Respectfully, the statement that ISI factors from Bottomley II would have been obvious to incorporate into Bottomley I is contradicted by the evidentiary record.

Further, and perhaps more importantly, Bottomley I and Bottomley II, taken alone or in any combination, do not teach or suggest the limitations of the claims at issue. Each independent claim (1, 17, 31, and 45) includes limitations directed to scaling an estimate of the ISI in a received signal using a cancellation metric comprising a scalar value representing characterized or measured ISI cancellation performance of an ISI-canceling receiver. Each independent claim further includes limitations directed to using the resulting scaled estimate of ISI to estimate received signal quality based on the scaled estimate of ISI. Consequently, all independent claims and their corresponding dependent claims patentably define over Bottomley I and Bottomley II, and the Applicant respectfully submits that the entire case stands in condition for allowance.

While all pending claims 1-47 are believed to stand in condition for allowance in view of the above evidence and arguments, further significant errors appearing in the factual record merit discussion. For example, claim 5 claims storing the claimed cancellation metric in memory as pre-configured value. (As an example, the specification teaches in paragraph [0030] that the cancellation metric can be predetermined as a scalar value representing the characterized ISI cancellation performance of the receiver.)

In rejecting claim 5, the Office Action states on p. 8 that the combination of Bottomley I and Bottomley II teach this limitation. For support the Office refers to Bottomley I, Section III. Applicant has searched Section III of Bottomley for any teachings related to the limitations of claim 5 and can find no reference to any pre-configured stored value representing a cancellation metric, or anything that is even arguably related. Applicant respectfully requests the Office to particularly point out where Bottomley I is alleged to provide the teachings of claim 5. Applicant

also points out that p. 6 of the Office Action concedes that Bottomley I does not teach a scalar-valued cancellation metric, while the argument against claim 5 implies that it does. Applicant submits that these teachings are entirely absent from the reference.

Further, claim 6 includes the limitation of determining the pre-configured value to be used as the cancellation metric based on characterizing the ISI cancellation performance of the ISI-canceling receiver identified in claim 1, or by characterizing another receiver of the same type. Page 8 of the Office Action flatly asserts that Section III of Bottomley I teaches the limitations of claim 6. Again, Applicant has scoured Section III of Bottomley I and can find no teachings remotely related to claim 6. Applicant respectfully requests that the Patent Office identify where Bottomley I is alleged to teach characterizing an ISI-canceling receiver to determine the value of a cancellation metric to be pre-stored as a scalar value in the memory of an ISI-canceling receiver. Applicant submits that these teachings are entirely absent from the reference.

Further, claim 7 includes the limitation of dynamically determining the claimed cancellation metric based on measuring the ISI cancellation performance of the receiver during operation. Page 8 of the Office Action flatly asserts that Section III of Bottomley I (Subsection B: Combining weights and finger delays) teaches the limitations of claim 7. More particularly, the Patent Office states without explanation that one skilled in the art would know that combining weights and finger delays can be updated to dynamically account for time-varying channel impairments. However accurate that observation may be, it is completely irrelevant to the claimed limitation of dynamically maintaining a cancellation metric meant to represent the ISI cancellation performance of a received, based on measuring its ISI cancellation performance during operation.

Regarding claim 15, Applicant claims "storing a cancellation metric for each of one or more supporting network transmitters, and wherein "scaling the estimated inter-symbol

interference by a cancellation metric..." comprises "scaling an estimated inter-symbol interference estimate for each of the one or more network transmitters by the corresponding cancellation metric." Remarkably, the Office Action on p. 11 asserts Bottomley II, Equations 8-11 and Bottomley I, Section III and Fig. 2, teach this limitation. Equations 8-11 in Bottomley II have nothing to do with different supporting network transmitters, nor does anything in either Bottomley I or II even hint at storing different metrics of any type for any purpose, in correspondence to respective supporting network transmitters. There is not the first shred of support for this rejection in either Bottomley I or Bottomley II.

In many other respects, the various dependent claim rejections fail. However, the errors underlying the rejection of the independent claims suggest that continuing the analysis of each dependent claim's rejection arguments is not warranted, nor useful in advancing prosecution on the merits. Fundamentally, the actual teachings of Bottomley I and Bottomley II are at odds with the assertions made by the Patent Office, where all claim rejections depend on those erroneous assertions. Neither Bottomley I or Bottomley II, nor any attempted combination of those two references, teach or suggest the limitations of the claims at issue. Applicant submits that claims 1-47 are allowable as presented herein, and therefore looks forward to the Office's next correspondence.

Respectfully submitted,

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